What is claimed is:

1. An optically active fiber for making a fiber laser or an amplifier, comprising:
a core, doped with an optically excitable ion having a three-level transition, the core having a core refractive index and a core cross-sectional area;
an inner cladding, surrounding the core, the inner cladding having an inner cladding refractive index less than the core refractive index, the inner cladding having an inner cladding cross-sectional area between 2 and 25 times greater than that of the core cross-sectional area, and the inner cladding having an aspect ratio greater than 1.5:1; and
an outer cladding surrounding the inner cladding, the outer cladding having an outer cladding refractive index less than the inner cladding refractive index.

2. The optically active fiber of claim 1, wherein the core is sized sufficiently small such that the core supports only one transverse mode at the output signal wavelength, and the only one transverse mode has a mode field diameter equal to that of a standard single mode fiber for optimum coupling.

3. The optically active fiber of claim 1, wherein the core is doped with the optically excitable Yb ion having the three-level transition at about 980nm, the inner cladding having the inner cladding cross-sectional area between 2 and 8 times greater than that of the core cross-sectional area.

4. The optically active fiber of claim 1, wherein the optically excitable ion requires a certain level of average inversion $n_{2(bar)}$ for optical amplifier or laser operation at the three-level transition, the inner cladding cross-sectional area is less than

$$A_{clad} \leq \frac{\sigma_{ap}\tau(1-\bar{n}_2)(P_{in}-P_{out})}{h\nu\bar{n}_2 \ln(P_{in}/P_{out})}$$

, where σ_{ap} is the pump absorption cross-section for the host material of the core, $h\nu$ is the pump photon energy, (τ) is the metastable level lifetime, P_{in} is the available pump power and P_{out} is the amount of that pump power

permitted to be not absorbed.

5. The optically active fiber of claim 1, wherein the core and the inner cladding are made from different compositions of antimony-silicate glass.

6. The optically active fiber of claim 1, wherein the difference between the outer cladding refractive index and the inner cladding refractive index is large enough to ensure that the inner cladding numerical aperture NAclad satisfies the condition

$NA_{clad} > NA_{laser}*D_{laser}/D_{clad}$,

where NA_{laser} is the numerical aperture of a broad-area pump laser in a slow axis,

D_{laser} is the size of the broad-area laser light emitting aperture in a slow axis and D_{clad} is the longer dimension of the inner cladding.

7. The optically active fiber of claim 1, wherein the difference between the outer cladding refractive index and the inner cladding refractive index is large enough to provide a numerical aperture (NA) greater than 0.3.

8. The optically active fiber of claim 1, wherein the inner cladding is made from a glass having a coefficient of thermal expansion (CTE) mismatch with the material of the outer cladding of less than +/-30 $x10^{-7}$/°C over the range 0-200°C.

9. The optically active fiber of claim 8, wherein the core is made from a glass having a coefficient of thermal expansion (CTE) mismatch with the material of the inner cladding of less than +/-30$x10^{-7}$/°C over the range 0-200°C.

10. The optically active fiber of claim 1, wherein the optically active fiber is utilized in a double-pass geometry where a pump light is launched into the optically active fiber through a signal bandstop filter and signals are launched at the opposite end of the optically active fiber through a first port entering into a second port of an optical circulator, wherein the optically active fiber experiences double-pass gain as a result of the population inversion created by the pump light and reflection by the signal bandstop

filter for providing signal extraction via a third port of the circulator for making the amplifier.

11. The optically active fiber of claim 1 further comprising a tilted micro-optic dielectric filter for multiplexing a pump light into the inner cladding and a signal into the core of the active fiber for making the amplifier.

12. The optically active fiber of claim 1, wherein the core has a graded index.

13. The optically active fiber of claim 1, wherein the outer cladding is doped with a signal absorbing dopant to prevent amplification of the inner cladding modes.

14. The optically active fiber of claim 1 wherein the optically excitable ion is Er producing a three-level amplification for making a C-band Er amplifier, the inner cladding cross-sectional area is less than 780 μm^2.

15. The optically active fiber of claim 1 wherein the inner cladding has a generally rectangular cross-section.

16. The optically active fiber of claim 1 wherein the inner cladding has a generally elliptical cross-section.

17. The optically active fiber of claim 1 wherein the inner cladding has a generally elongated cross-section.

18. The optically active fiber of claim 1 wherein the inner cladding has a generally "Saturn"-like shape.

19. The optically active fiber of claim 1 further comprising a pump reflector coupled to or inscribed in the optically active fiber.

20. The optically active fiber of claim 1, further comprising at least one dielectric mirror deposited on a cleaved or polished end of the core.

21. The optically active fiber of claim 1, wherein the core and the inner cladding form a single waveguide made of a material with a continuously varying composition such that the refractive index is progressively decreased from a central part to an edge of the waveguide, the central part of the waveguide is doped with the optically active ion having the three-level transition to form a doped area, and the overlap between the fundamental signal mode of the waveguide with the doped area is not more than seven times larger than the overlap of all pump modes of the waveguide combined with the doped area.

22. The optically active fiber of claim 1, wherein the optically excitable ion is Yb for use as an Yb double-clad fiber laser for pumping an Er-doped fiber amplifier (EDFA).

23. The optically active fiber of claim 1, wherein the optically excitable ion is a rare-earth element for use as a double-clad fiber laser for pumping a fiber with Raman gain.

24. The optically active fiber of claim 1, wherein the inner cladding is doped with a signal absorbing dopant to prevent amplification of the inner cladding higher order modes, where the absorbing dopant has a minimum overlap with the fundamental mode.

25. The optically active fiber of claim 1, wherein the core cross-sectional area is dimensioned such that the higher-order modes of the inner cladding experience a lower overlap with the doped area than the fundamental mode.

26. The optically active fiber of claim 4, further comprising an intra-cavity transverse-mode-selective element coupled to the output of the optically active fiber for selecting the lowest transverse lasing mode.

27. A fiber laser comprising:

a broad-area laser diode having a pump light having an output power of at least 1 Watt;

a double-clad optically active fiber having a first end for receiving the pump light and a second end for outputting a laser signal, the double-clad optically active fiber including

a core for supporting close to a single-mode transmission of the laser signal, the core having a cross-sectional core area, the core doped with a plurality of optically excitable dopants having a transition requiring a high level of inversion at a desired signal wavelength of the laser signal;

an inner cladding disposed adjacent to the core having an aspect ratio greater than 1.5 and configured sufficiently small to match a laser mode field geometry of the pump light to allow the inner cladding to optically deliver the pump light to the core at a high pump power density, the inner cladding having a cross-sectional area approximately 2 to 25 times larger than the core area to allow a sufficiently high overlap between dopants in the core and the pump light, such that the high pump power density and the high overlap between dopants and the pump light provide the required level of inversion for lasing with a low power threshold and high efficiency; and

an outer cladding disposed adjacent to the inner cladding having an index of refraction less than the inner cladding for confining the pump light.

28. A fiber amplifier comprising:

a broad-area laser diode having a pump light having an output power of at least 1 Watt;

a double-clad optically active fiber including

a core for supporting close to a single-mode transmission of the amplified signal, the core having a cross-sectional core area, the core doped with a plurality of optically excitable dopants having a transition requiring a high level of inversion at a desired signal wavelength of the amplified signal;

an inner cladding disposed adjacent to the core having an aspect ratio greater than 1.5 and configured sufficiently small to match a laser mode field geometry of the pump light to allow the inner cladding to optically deliver the pump light to the core at a high pump power density, the inner cladding having a cross-sectional area approximately 2 to 25 times larger than the core area to allow a sufficiently high overlap between dopants in the core and the pump light, such that the high pump power density and the high overlap between dopants and the pump light provide the required level of inversion for amplification with a low power threshold and high efficiency; and

an outer cladding disposed adjacent to the inner cladding having an index of refraction less than the inner cladding for confining the pump light.